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AN ACCOUNT OF  
ILLUSTRATED TALKS  
TO  
NOTED INDIAN CHIEFS  
ON SCIENTIFIC SUBJECTS ON THEIR VISITS  
TO THE  
CARLISLE INDIAN SCHOOL

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Paper read before the Hamilton Library Association,  
Carlisle, Pa.—The Historical Society of Cum-  
berland County, Pennsylvania  
November 17, 1916

BY  
PROFESSOR CHARLES F. HIMES



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SON OF THE STAR—  
AN ARICKAREE CHIEF.

THE RIGHT HAND GRASPS A POLE FROM WHICH DANGLES THE SCALP-  
LOCK OF A SIOUX: THE LEFT HOLDS AN EAGLE-WING FAN RESTING ON  
HIS LAP.

TAKEN DURING A VISIT TO THE CARLISLE INDIAN SCHOOL.

*J. N. Choate, Photographer.*

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## THE WHITE MAN'S WAY

Illustrated Talks on Scientific Subjects to "Indian Chiefs" on their visits to the Carlisle Indian School, by Professor Charles F. Himes, Ph. D., Read before the Historical Section of the Hamilton Library Association, Carlisle, Pa.

The so-called Indian School at Carlisle, Pennsylvania, will always be regarded as one of the most interesting of the educational institutions of our country, and of the period to which it belonged, in its purposes, its methods, and its accomplishments. I have purposely not called it by its full title, "The Carlisle Indian Industrial School," because it was, or became so much broader in its aims and its results than might be suggested by the term "Industrial."

After it shall have completed its work, and ceased to exist, as time passes, its history will have an even greater interest than now, as a chapter, and a very influential one, in the solution of a great problem that had almost seemed to defy solution, and many incidents apparently trifling to us now, may acquire at least historic interest in elucidating some features of its work.

By way of explanation then of the selection of the particular subject for the paper of the evening, I would simply say that it has been prepared at the suggestion of some, not simply interested in the Indian problem, but in the preservation as a matter of history, of any incident in any way connected with the development of the Indian, in his course toward American citizenship, and ultimate complete absorption into the body of the American people; when there will be no more Indians, but simply citizens of Indian descent; a con-

sumation to which the Indian School will be recognized as a most potent factor, and which may be realized much sooner than may now be imagined.

Before entering upon the subject proper a brief resume of the inception of the Indian School may assist in making clear the connection of the subject.

The great problem that forced itself on to the Christian nations of Europe by the discovery of America by Columbus, was their relation to the non-Christian, heathen, savage, if you please, aborigines of the New World, and how to deal with them. That great problem runs through the whole course of the history of our country to our day. Each nation in its eagerness to get a share of the great domain based a claim to some particular portion of the Continent on the so-called "Right of Discovery;" and by common consent this right was regarded as paramount to any right of the then occupiers of the soil. This right, which is characterized by Justice Story as "doubtful in its origin and unsatisfactory in its principles," became the established foundation of the title of European nations to territory in America, without the slightest regard to the rights of the native tribes. These the Christian nations treated as mere barbarians and heathens, "deemed them as mere temporary occupants of the soil," whom they might convert to Christianity, or if they refused conversion, "they might drive from the soil as unworthy to inhabit it." The Indians, on the other hand, "deemed themselves as rightfully possessed, as sovereigns, of all the territories," and disputed what they regarded as encroachments on what they had been in undisputed possession of. Whilst the rule of might controlled, and most of the soil was acquired by the irresistible



might of arms, much, it is true, was acquired by right of purchase, often it is true under duress. As was natural war became a chronic condition of the country, and some of the greatest and most lauded heroes of our country were those who fought Indians successfully, at times with a barbarity approaching their own.

The first question, and perhaps the most important one, was, how far the Indians were capable of education and Christianization, especially the latter, which however seemed possible of accomplishment by the methods of that day. But the broader question, whether they were equally capable of the highest intellectual development in all directions with their Christian conquerors, seems hardly to have entered into serious consideration; a question taken up by the Carlisle Indian School, and to which it has given so complete an answer, that it now seems almost that it could never have been a serious one.

But many will remember, when the Indian question was an open one, and Indian wars were chronic, the trite saying, endorsed by many army officers, that, "the only good Indian was a dead Indian." Even at the time when Captain, now General Pratt, suggested and urged the turning over of the Barracks here, then unoccupied for seven years, for the use of an Indian School and the detail of an officer of the army to have charge, the above remark was heard on many sides, and failure predicted by many experienced in Indian affairs; even the great General of the Army, afterward a warm supporter of Capt. Pratt and his work, was not favorable to detailing an army officer for Indian educational work, and called it "old woman's work."

It was nothing but Captain Pratt's faith in the Indian, as well as his

humane interest in him, born of his contact with him, not only in fighting him on the frontier, but in his use of him in most dangerous and responsible duties there as scouts, that not only prompted the experiment, but sustained him amid the discouragements not only incidental to the experiment itself, but thrown into his way at times by those whose hearty co-operation he had a right to expect.

His charge of seventy-four selected bad men from the Kiowa, Comanche, Cheyenne and Arrapahoes; taken by him from Fort Sill to Florida, in the spring of 1875, thousands of miles from their homes, in irons, to be confined in old Fort Marion for three years, proved his opportunity to demonstrate the correctness of his views in regard to the Indian. These men had been shown, by the testimony of Indians and whites, to have taken part for several years in raids, murders of immigrants and settlers, and acts of violence of all kinds. The proposal to try them by Military Commission was pronounced illegal by the Attorney General of the United States; so they were sent to Florida in charge of Captain Pratt. They were transferred, securely chained, in army wagons, 140 miles from Fort Sill to the railroad, guarded by two companies of infantry and two of cavalry. On the cars from Fort Leavenworth one chief tried to commit suicide, but rallied; but on reaching Fort Augustine he refused food, and starved to death. Another jumped from the car and was shot. Several died. The rest were confined in the fort under heavy military guard.

The success of Captain Pratt in winning over these apparently, absolutely incorrigible savages to complete obedience long before the expiration of the three years, gave him some claim to consideration. In a

comparatively short time they were so controllable and trustworthy, that he obtained permission for them to act as their own guards, and of the fort as well. They acquired the English language, and at the termination of their period of captivity many desired to remain.

The Indian School at Carlisle grew in great measure out of this incident. It was the child of the heart and brain of this really great man, and settled in its broad way the capacity of the average Indian for the highest intellectual culture, as it could have been settled in no other way; for it was not an experiment on a small scale, or for a few years; nor with a few selected pupils, from selected tribes; nor was it confined to pupils regarded as of suitable age; but its pupils, from the beginning, were of a wide range of ages, from a number of tribes, ultimately seventy-nine, indiscriminately selected. Thus, in continuous operation for twenty-five years, the school left no phase of the Indian question untouched.

This little prefatory statement, with its appreciation of General Pratt, may seem almost superfluous before a Carlisle audience, most of whom knew him personally, as he went in and out amongst them as a citizen for twenty-five years; but to others and to the coming generation it may serve as a fitting record.

To the ordinary educator the purely pedagogical questions, without other complications, would have rendered the task assumed by Captain Pratt an almost hopeless one. The children, consisting of boys and girls, arrived in their camp condition—long hair, blankets, leggins, moccasins, etc.,—and as they played or lolled listlessly on the sward about the old Barracks, they did not present a very encouraging appearance; and when to appearances was added the fact that eleven

different tribes were represented, with as many distinct dialects, practically different languages, and absolute ignorance of English on the part of all, the point of attack upon the problem now to educate them, did not readily present itself.

But the broad purpose that runs through all the methods and plans in conduct of the school falls in with the expression of President Grant, in his first inaugural, adopted by Captain Pratt, in favor of any "course which tends to their civilization and ultimate citizenship." To accomplish this set purpose, every effort was made, not simply to educate in the ordinary sense, but, as Captain Pratt expressed it, to "environ them in our civilization," controlled always by his belief that "The Indians are just as capable of development and usefulness in all respects as we are." To this end the "Outing System" was earnestly advocated by him as essential to supplement the class-room and Industrial Shop.

General Pratt was alert, as might be expected, to any thing that might in any way assist in carrying out any part of his plan. Pupils were a first and a prime necessity. He had been obliged, at the start, to overcome a decided and rather natural distrust on the part of the leading chiefs, and a hesitancy on their part to send their children thousands of miles from their homes, uncertain as to what might be done with them. It was only by the most consummate tact joined to his intimate knowledge of the Indian, on his appearance before a big council of leading chiefs, after it had absolutely, and apparently decisively refused to give their children, that, after he had presented the case and retired from the council, on further discussion, it reversed its action, and the pupils were given him.

Many of these chiefs, in the early



days of the school, visited it, to see for themselves. It was very important that they should then be favorably impressed, so that they would not, at least, discourage the further sending of pupils, necessary to the growth and continuance of the school. It was desirable, not simply to remove distrust, but to impress upon these leading men of their tribes, in every way the superiority of the "White Man's Way."

Realizing the prominent part that scientific achievement played in this superiority over the Indian's Way, the speaker was asked by Captain Pratt whether he would do something with the resources of the scientific department of the College, to interest these chiefs; a request that was cheerfully complied with; and, on a number of occasions, groups of them were invited to the Scientific Lecture room of the College, and talks given, suitably illustrated, and with the aid of an interpreter.

Some of the visitors bore the following names:—Red Cloud, Iron Wing, Spotted Tail, American Horse, Young Man afraid of his Horses, White Thunder, Two Strike, Milk, High Wolf, Black Bear, Black Crow, Swift Bear, Brave Bull, Standing Cloud, Standing Bear, Poor Wolf, Son of the Star, Ouray, and others. They were, as a rule, in full Indian costume of blankets, leggins, feathers, etc.

It seemed worth careful consideration how to make the most out of the time at our disposal. These Indians were above the average of their race; they were leaders in their tribes. They had come to see for themselves, how their children were treated; how and what they were taught. The motive with them was more serious than mere idle curiosity. They were mature and thoughtful. They were in their way practical, shrewd observers, alert to everything, willing

to be amused and entertained, but more desirous to learn than to be entertained. They could not but have noticed, on their way from far-off environment, many things that struck them with wonder—our rail roads, our telegraphs, and all the appliances of our higher civilization. To have treated them to a usual popular lecture, with sensational experiments would have been to have half-wasted a big opportunity.

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The subject of one of the talks—"The White Man's Way of Finding Out Things," rather ~~of~~ simply doing things, seemed to interest them from the start, and the close attention paid even to the most trifling experiments, and the evident satisfaction shown at the close, confirmed the view just expressed in regard to the character of the audience.

As they were not only wanting in pedagogical training, but their language was a perfect blank in scientific terms and phraseology, the simplest possible words were employed, largely out of consideration, too, for the interpreter, who would have had a struggle to put scientific terms into Indian vernacular, or to have rendered them at all intelligible.

As the purpose of the talk, then was to impress them, how much the White Man's superiority was due to his intellectual methods and his mode of attack on the physical problems continually forcing themselves upon him, it occurred that this could be most efficiently done by following the historic line of development of some branch of science, from the earliest, simplest observed facts to present great practical results. With this in view, the subject selected was what we could call "Magnetism", or might call "From the Lodestone to the Telegraph"; but for which with them I had no name, and did not need any.

By way of 'introductory' I told

them that, in thinking over how I could use the time we were together best for them, I concluded that I would not just amuse them; that I realized that they were not children, and so I wanted them to follow closely with their attention, whilst I tried to explain to them the secret of the White Man's superiority, and might tell them something to think about after they had left for their homes.

The whole secret, I said, is in the White Man's way of finding out things and using them. It is not only the way that he has used, but that he is using today, and the way he will use for years to come, and the way on which all progress depends; and it is the way that is just as open to Indians, especially to the Indian boys and girls, who are being taught everything that the white man knows, at this school.

I am going to talk about what is called "Magnetism"; but that is only a word, that does not as yet mean anything to you, so do not trouble yourselves about it. I am going to talk to you about things, and we may come to the words when we need them.

Here are a lot of stones. Very common looking stones. And they are very common stones. You may have seen every kind of them.

I roll them all in these iron filings. You see they stick only to this one. I do not know why, for there is nothing sticky on the stone. I can easily pull them off. I select this stone out of the lot because it is not only a very wonderful one in itself, but one that in the White Man's hands, and in his way, we will find was the starting point of many wonderful things. But what I have shown you is not much in itself. A white man happened to find it out hundreds of years ago. It was not much then, and he did not find out much more about it. But

he wrote down all he knew about it in a book. So when he died all that he had found out lived after him. Other men read his book and found out more about it, and wrote down all they found out. So for many hundreds of years white men were finding out more and more about it.

Now let us follow some of these very rapidly.— I put one end of this little iron rod into the filings. They do not stick to it. I touch the other end of the rod with the stone, and see, the filings now stick to the end of the rod away from the stone. I take away the stone, and the filings fall off from the other end. So some how the stone sends its power along the rod to the other end. Now I take a rod of another sort of iron—called steel—it does not hold the iron filings. I touch it with the stone, it lifts them. I take the stone away, and, wonderful to see, it still lifts them. Now I take this long steel needle,—a knitting needle—that has been made to lift the iron filings by being rubbed with the stone; I hang it in this little paper stirrup by an untwisted thread. I turn it around a little; when I let it go, it swings back to its first place. I may turn it to either side; it always turns back to its first direction.

I put one on this pivot, so that it can turn around, and it acts in the same way, and always points in the same direction as the suspended needle.

This was one of the most wonderful discoveries made by the White Man. It is not only wonderful in itself, but in the use made of it.

It has a great deal to do with your being here tonight and my talking to you.

When you go over the big broad treeless prairies, in cloudy weather, without sun or stars to guide this needle, that always and everywhere swings in the same direction, will tell



you the way. It always points nearly to the North Star, whether you can see the star or not. Very little needle like this that you can carry in your pocket answer this purpose. The surveyor uses it in running the lines of your lands.

But this was not the first and most far-reaching use made of it by the White Man. Sailing on the big, broad trackless waters, bigger than the prairies, often without stars or anything else to tell the way, it was much easier to lose the way, so that it was hundreds and hundreds of years before the White Man would trust himself in his ships far enough from the shores of the continent on which he lived to reach the one on which you lived. But it was not long after the discovery of this needle, when Columbus was bold enough to sail straight out toward the West, not knowing what he might find, until he reached the home of the Red Man; and with the needle he easily found his way back to tell of his great discovery of a New World. Since then ships have been plowing their way back and forth, rain or shine, with certainty. This itself would make this stone worth studying, and I have taken it to talk about because the steps were so simple to big results.

But now we will take a little time to show some other discoveries about it, just as simple, out of which the White Man has made a great deal.

The attraction and repulsion of the ends of the needles was shown, and, what was more wonderful, that this two-endedness belonged to the pieces of a broken needle, however often it was broken. It was impressed upon them that we can not explain this; but it is only just so.

But now we will connect with these discoveries some other things that the White Man found out in almost as simple a way. Here are two pieces of

metal, with long wires soldered to their ends, nothing more. I dip them into this jar of liquid, not water, and touch the ends of the wires together, and hold it above the needle; see, the needle swing around; I take the ends apart and it swings back. It does not make any difference how long the wire is, or how far the needle is away; it might be a mile, or miles away. The white man took to studying this hard. One wrapped the wire around a bar of iron, which did not lift iron, as I do, but when the ends of the wires are made to touch each other, see, the bar holds tacks and nails; and when the ends of the wires are separated, the bar loses its power; the tacks and nails fall off. The bar, too, is two ended when the ends of the wires touch, just as the needles were two-ended.

Now we have gotten far away from the lodestone that started the whole subject, but we seem to have found some near relation to it. We have come to a point at which we can make magnets, as we call them now, as we please, and, what is just as important, unmake them too; and we can also make them much stronger than with the stone.

A large horse-shoe electro-magnet was shown. A Chief was asked to put the keeper on very carefully, and to his surprise it was drawn from his fingers, and with almost as much surprise he saw it fall off when the current was broken. When it was explained that any piece of steel could be permanently magnetized, and a knife was suggested, a large one was passed up. It was shown to have no attractive power. It was then magnetized, and lifted a variety of pieces of iron; and it was impressed upon them that it would retain this power after the owner got it back. On return to him it was carefully and exhaustively examined by all of them.

It was looked over from every side; it was felt and rubbed; then tasted and finally smelled. All the natural tests at their command having been exhausted without result, it was quietly pocketed. But there were more and more knives sent up for treatment, apparently until every one had a magnetized knife to carry home with him. Incidentally when the wires sparked a little, on making contact with the battery, although it was placed far back on the table, some one was quick to observe it; and one would nudge the other to call attention to it, interested to be certain that no one would lose anything.

The great importance of the power to make and unmake magnets at will at almost any distance was dwelt upon, and fully illustrated by apparatus placed in different points of the room; and the construction and use of 'keys' for convenience in making and breaking contact was illustrated and explained; and that the culmination was reached in the application of this by the White Man to send messages for miles over wires. A large model of a telegraph was placed in different parts of the room, and its construction explained, and that the wires might reach to Philadelphia or even further. The attention was called to the clicking similar to that, that they had doubtless noticed at the rail road station, where it was bringing a message in the language the White Man had given it, and writing it on strips of paper as he had directed.

Now all this started with that little apparently insignificant stone, hundreds of years ago; but that stone had hidden in it wonderful powers, and the key to unlock many others almost as wonderful. All these applications, and many others, that I have not time to tell about, followed step by step from what some one happened to notice in that stone hundreds

of yars ago. So you see that the White Man did not reach the telegraph by a leap and a bound; but it grew in his brains; it did not grow in one day, or through one man. It was just as if those early men were laying foundations, and those who came after were building on them. In the last few years they have run their wires undert he big broad ocean, and are now talking back and forth, to and from the continent from which Columbus sailed.

But there is every reason to believe that there are still bigger things to be found further on, and the White Man is still going on, and he wants the Indian to go with him, and help him if he wishes.

Now you may be tempted to think that there were many things I did not explain as fully as you might have liked. If so that was partly because I had not time, but much more because I did not know. The White Man finds out things and uses them; whether he can explain them or not, and most of the times he can not explain them. If you had gotten a rifle, you would be apt to use it, whether you could explain all about it or not or whether you knew how it was made and all about it, or not, if you just knew enough about it to use it. I have kept nothing secret. The White Man has no secrets. Whatever he knows your boys and girls will be taught, as well as his boys and girls; he makes no difference; and may be some of your boys and girls will be finding out something even more wonderful than I have shown you, for the White Man has come to think that what he does not know is far more than what he has found out.

Now I hope you realize that I have not been treating you as children, but like grown up men, who can see a great deal, and think a great deal more. The time has been very short,

and I have had to speak through another, to whom we are all very much obliged, for I know it has been very hard for him; but it never goes as well as when we can speak to each other straight.

But you will at least know more of what and how your children are taught, and of the White Man's way, than if I had simply amused you; and I know by the way you have listened that you have enjoyed it more; and thank you for your attention.

But they did not leave their appreciation to be inferred only by their attention, accompanied by manifest expressions of pleasure, as points were fully brought out by frequent repetition; but they did their best to put it into more formal expression by coming up, some of them almost waddling, as it were, in their blankets dangerously near to the apparatus, behind the lecture table, to offer their hands and say their "howdy", that single word into which the Indian can put so much of "thank you", and good will generally, as well as conventional inquiry after your well being. They even felt that the same attention was due to my wife, present as a highly interested spectator—of the audience.

The difference between these talks and the ordinary popular or educational lecture will appear from a brief account of one given in the same place, to a class of more advanced pupils of the school. It was sent me recently by Gen. Pratt, as reported at the time by one of the teachers present.

"About forty of the older boys and girls were made to wonder at the power of the white men's "medicine", by a lecture on "Lightning" by their good friend Professor Charles F. Himes of Dickinson College. The stroke of lightning that knocked the miniature house to pieces was so real that all were



startled, and the girls gave the usual little civilized screech. The most amusing thing was when the spark of electricity passed from Roman Nose's nose to High Forehead's knuckle; while they two were badly shocked, the remainder of the party were convulsed with laughter. Prof. Himes seems to have enough of lightning to go around, for when Mr. "Talks with Bear" and Mr. "Kills without Shooting," and Mr. "White Whirlwind," and Mr. "Short Leg," and Mr. "Runs after the Moon," and Mr. "Wants to be a Chief," and Mr. "Makes Trouble in Front," and Miss "Wooden Ear Rings," and Miss "White Cow," and Miss "Red Road," and Miss "Stands Looking" and Miss "Brave Killer" and a dozen others took hold of hands to test the strength of Prof. Himes' electric medicine, most of them found it stronger than they could stand, but a few of the boys held on to the last, although they did get badly jerked."

An account of another entitled "Why Does it Burn" runs as follows:

Professos Himes of Dickinson College gave the Indian boys a number of experiments at the College laboratory on Tuesday the 13th inst. (Jan. 1880.) The clear and tense explanation of each experiment by the Professor, added to the interest, and when he touched off a quantity of powder with a drop of water, the surprise of the boys was unbounded. The boys were highly delighted with their treat, and the school authorities feel greatly indebted to Prof. Himes for his kindly interest in the pupils, and generous gifts of time and ability to aid in the work of enlightening their darkened minds."

At an other time a talk to a differ-

ent group of Chiefs, along similar lines, was upon "Different Kinds of Air." The use of the term 'air' has not only the advantage of being a little, vernacular word, but it was strictly, we might almost say classically scientific in this connection, for Priestley entitled the volumes in which he describes his discovery of Oxygen, "Experiments and Observations on Different Kinds of Air," and in accordance with the theory of that day named it Dephlogisticated Air, and spoke of fixed air, inflammable air, and many kinds of 'air' that we speak of as gases. So we distinguished the airs that we found in our experiments by names suggested by the properties they manifest.

Attention was first called to the fact, that there was something all around us; we could not see it, but all the same we could feel it, and when it got roused sometimes it could treat us pretty roughly in the form of wind. Hundreds of years ago, they could hardly think of it as anything real, like water, or wood or the like, but it seemed more to them like spirit. But we know now that it is something, just like anything else is something, indeed that it can even be weighed. So we will speak about it as if it is something real.

I put a candle under this jar. It soon flickers and goes out. Why?

You might say it has spoiled the air. That would be true, but only as far as it goes. But I keep on asking—How? It may have taken something out of the air in the jar; that it may have used up something, that it needs to burn. Or it may have put something in that would not let it burn, or possibly both. Let us try to find out. But right here I wish to say first, that if I had put a mouse in a jar, it would have died in a short time too; and I want to say once for all, that where a candle can not burn no animal—

man or beast—can live. Here I have something that burns harder than a candle. A piece of it on a cork, phosphorus floating under the bell jar, in the pan of water, burns brilliantly; but it goes out too. But notice that the water is creeping up in the jar. It stops when it is about one fourth of the height of the air still remaining in the jar. That means that about one part out of five of the air has been taken out. I put part of what was left, into another jar, and test it with a candle. The candle will not burn. I keep the other part of it for another experiment with it after while, that will tell us more about it. But first what is this fifth that was taken out like?

A little over forty years ago, all the chemists, as they were called, all over the world, came together at different places to honor the man who 100 years before had found it out. The Americans came together at his grave, which is in this country. It was considered then, and is considered now, the greatest discovery of the kind ever made, and was the starting point for many more discoveries.

At first he could make only small quantities, but we have learned to make it so easily, that I have made as much as I may need to show what this wonderful kind of air is like and what a big part it plays for us.

We will use our candle again to ask questions. You see how brightly it burns in the jar. This little splinter with just a little glimmer of a spark on the tip burns into full flame, as soon as it touches the top of the air in the jar. Now I will try something that is much harder to burn, in fact that will not burn at all in the air. This thin piece of steel—a watch spring, when I heat it red hot in the lamp cools down too fast to take fire when I put it in the jar. I have coiled it up so that I can have a bigger piece

of it, and I have tied a little piece of charcoal on the end with fine wire. I heat the charcoal; you see it glows like a little point until I can dip it in the jar; it grows brighter and brighter, and now, see, it has heated the steel until it begins to burn, and away it goes, throwing out showers of sparks, and melted balls that sizzle through the water that I left in bottom of the jar; some of them, in spite of it, burn their way into the bottom of the jar. You need not ask why I left water in the bottom of the jar. Some of the balls might even have burned their way through the glass. This then seems to be a very live air. The other might be called a sluggish do-nothing, lazy air. But it seems to be needed to slow up the other. If the air around us was all of the active kind every thing would burn up, even the stoves in which we make our fires. The Great Spirit seems to know how to use the lazy air. I wonder if he has any use for lazy people. But I said there might have been some different kinds of air put in by the burning candle as some active air taken out. It may be well to ask a few questions about it. We have found out all we can about it with the candle. Let us ask a question with something else. We call these things we ask questions with, 'tests.' Here is something that looks like water, but it is not water, but almost as simple, (lime water). I pour a little of it into this jar, which we call empty, but which is filled with common air. I cover it with a piece of glass and shake it up. There is no change in the liquid. I burn a candle in the jar. I shake it up, and see, the liquid becomes cloudy. I breathe in another jar and shake it up with the liquid, with same result. But this may after all be only the sluggish kind of air, answering to this new way of asking a question. Let us try the portion I

kept back for this. It gives no result. It is different air. So we have found three kinds of air at least in the air about us. But I can not let this air that the burning candle makes, and that we breathe out go without showing you something more about it. I can make it much faster than by breathing or burning a candle, with this apparatus. I have a large number of jars of it already made, so I will make only one. In this large jar are four little lighted tapers at different heights, just to tell us when the jar is full. See, one after the other goes out, at last the top one, and the jar is full. Now I take this small jar and carefully dip a jar full out. I pour in our test, shake it up, and there is no mistake; I have really dipped some out. Now I pour carefully out of the big jar into a little one, and it answers the question with the test. Now I put these little lighted wax tapers around on the table, and I pour the air out of the jar on to them, and they are put out by it as if it was water. But now I put the end of this board on this box making an inclined plane. You know water would run down. Let us try this air. Put some little tapers at the bottom. Pour out of the big jar carefully so that it does not run over the side. Out they go. But now I will try to weigh it on these grocers' scales. A glass jar would do to weigh water in, but it seems heavy and clumsy to weigh air in; so I will take this paper bag, open it out carefully, so as not to tear it, and make it leak; now balance the scales. Pour very carefully from the big jar into the bag, so as not to pour it all over; down goes the scale, and to be certain let us pour it out of the bag into a small jar, and ask for it with the usual test, and it promptly answers: Here. Many of these things may look to you like conjuring or magic, but there is nothing



about them, but the simplest, purest science, that any one could master in a short time. But of one thing you must be satisfied, that though you can not see the air around you there are many different kinds of air in it, and above all that the Great Spirit has mixed them just right for us; and as you have watched me pouring something, that you could not see from one jar into another, and rolling it down hill, and weighing on scales, you must have felt that there are somethings, that are really somethings that can not be seen, and I think you might suggest as a name for this air, from what you have seen about it, 'Heavy air.'

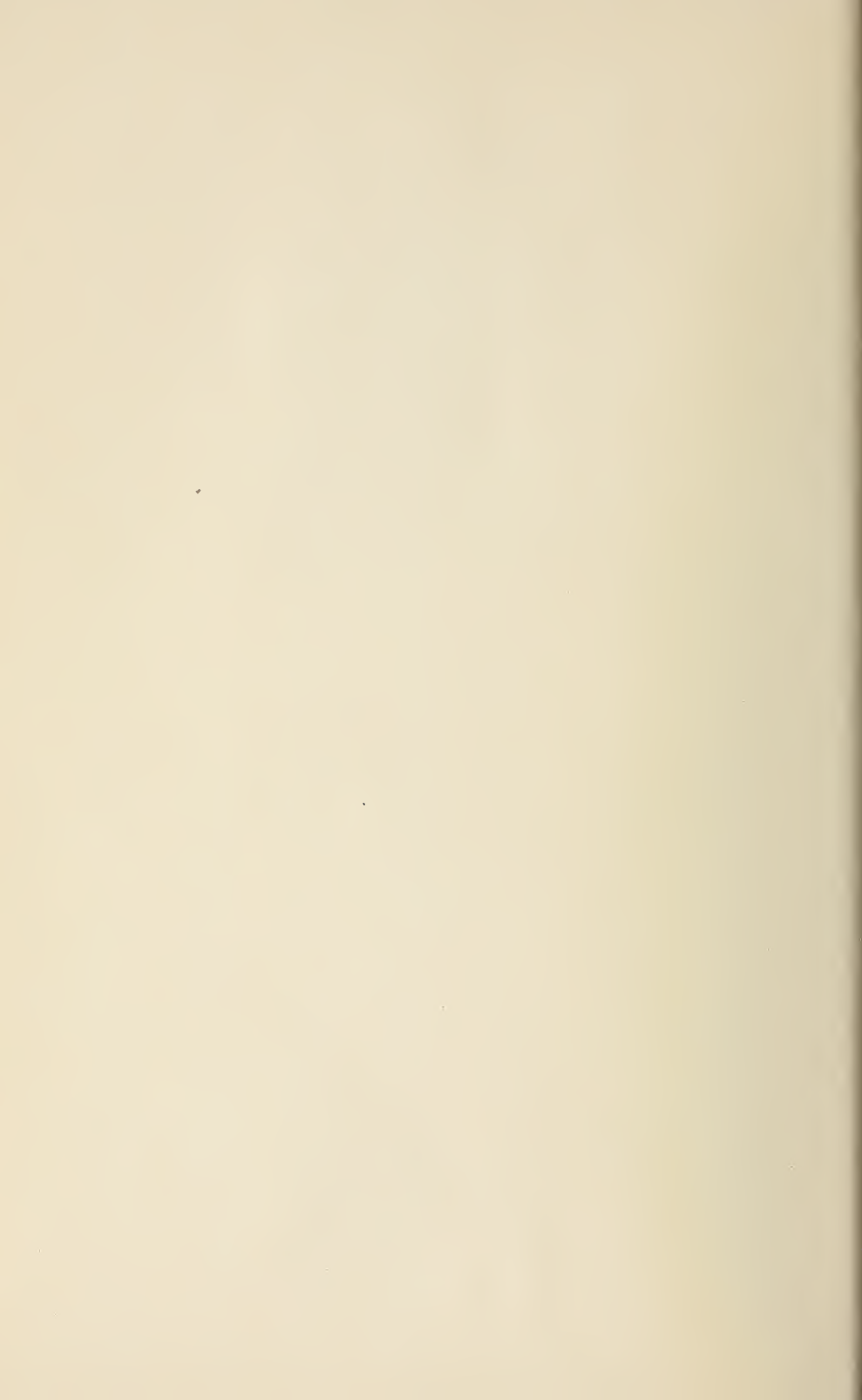
It has been a great pleasure to me to speak to you on this interesting subject, and I thank you for the attention and patience with which you have listened.

Of course it is understood that there were repetitions and amplifications to make clear or emphasize some points that make this account little more than a skeleton of the talk, the effort being only to show by it the purpose of the talks and the treatment of the subjects; and much that was common to both lectures was, of course, not duplicated here.

I would just add that the point of view of the auditors was so different from ours, that whilst they were stolidly indifferent, where we might have expectation to witness some excitement, at other times they were visibly affected by experiments that seemed trifling to us. Thus they submitted to having continuous electrical shocks almost without wincing, as if they were the merest common place experiences; but the very simple experiment to illustrate the pressure of the atmosphere, with the air pump and the hand glass, had a remarkable psychological effect. The hand glass was placed on the plate of the air

pump. A chief nearest was requested to place his hand upon it, which he did promptly. One stroke of the piston fastened his hand, with the full pressure of the atmosphere. He seemed more than surprised; there was almost a shade of anxiety on his countenance, as he felt himself suddenly gripped, as it were by an unseen force, from which he did not know how to release himself. I at once released him. He did not hesitate, however, to try it again, but seemed rather desirous to do so; and each one of the chiefs, who had witnessed the performance, and perhaps the first effect on his countenance, in turn presented himself for a similar experience.

















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